

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Currently Amended): A quantum communication system comprising:

an emitter configured to emit a plurality of photon pulses in groups of photon pulses, each group of photon pulses emitted over a group time period, ~~each photon pulse having a probability of containing at most one photon~~ wherein the average number of photons per pulse is less than 1;

a detector comprising gating means configured to switch the detector between an on state and an off state;

wherein the separation between pulses in said group of pulses is less than the time when a detector may register an after pulse signal or a false positive reading, the detector is in an on state for at least the duration of two photon pulses during said group time period, and the system is configured to ignore a second or subsequent pulse received by the detector in a group time period after a first pulse has been detected for the group of pulses.

Claim 2 (Currently Amended): The system of claim 1, wherein the detector is in an on state for the whole of ~~[[a]]~~ said group time period.

Claim 3 (Original): The system of claim 1, wherein the detector is repetitively switched on and off during said group time period, so as to be on during the arrival of the photon pulses.

Claim 4 (Canceled).

Claim 5 (Original): The system of claim 1, further comprising means to communicate a clock signal between the emitter and detector.

Claim 6 (Currently Amended): The system of claim 5, wherein a clock pulse of the clock signal is sent from the emitter to the detector with each group of ~~photons~~ photon pulses.

Claim 7 (Original): The system of claim 6, wherein the clock signal has a different wavelength to that of the photon pulses.

Claim 8 (Original): The system of claim 6, wherein the clock signal has a different polarisation to that of the photon pulses.

Claim 9 (Currently Amended): The system of claim 1, wherein the detector ~~[[is]]~~ comprises an avalanche photodiode.

Claim 10 (Original): The system of claim 1, wherein the photons which are sent to the detector are encoded.

Claim 11 (Currently Amended): The system of claim 10, wherein the each photon pulse in a group of photon pulses is encoded by a phase encoding means independently of the other pulses in the group of photon pulses.

Claim 12 (Currently Amended): The system of claim 10, wherein the photon pulses are encoded ~~using~~ by manipulating phase of the photon pulses to encode information in the photon pulses.

Claim 13 (Currently Amended): The system of claim 12, further comprising a first interferometer ~~having~~ comprising a long arm and a short arm, one of said arms ~~having~~

comprising phase variation means which allows configured to set the phase of a photon passing through that arm to ~~be set to~~ one of at least two values.

Claim 14 (Currently Amended): The system of claim 13, further comprising a second interferometer ~~having~~ comprising a long arm and a short arm, one of said arms ~~having~~ comprising phase variation means which allows configured to set the phase of a photon passing through that arm to ~~be set to~~ one of at least two values.

Claim 15 (Original): The system of claim 14, the detector being further configured to ignore signals from photon pulses which pass through the long arms of both interferometers or the short arms of both interferometers.

Claim 16 (Original): The system of claim 14, further comprising directing means configured to ensure that photons which have passed through the short arm of the first interferometer are directed down the long arm of the second interferometer and photons which have passed through the long arm of the first interferometer pass through the short arm of the second interferometer.

Claim 17 (Currently Amended): The system of claim 16, wherein the directing means comprises first polarising means configured ~~to allow~~ so that photons which have travelled through different arms of the first interferometer have different polarisations, and second polarising means which distinguish between the photons having different polarisations and direct them down the appropriate arm of the second interferometer.

Claim 18 (Original): The system of claim 12, wherein the phase encoding means comprises a first interferometer comprising a long arm and a short arm; and a second interferometer comprising a long arm and a short arm, the first and second interferometers

being configured such that a photon passing through the first interferometer experiences a different change in its phase to a photon travelling through the second interferometer, the phase encoding means further comprising first switching means to direct a photon into either the first interferometer or the second interferometer.

Claim 19 (Original): The system of claim 18, further comprising a third interferometer comprising a long arm and a short arm and a fourth interferometer comprising a long arm and a short arm, the third and fourth interferometers being configured such that a photon passing through the third interferometer experiences a different change in its phase to a photon travelling through the fourth interferometer, the system further comprising means to direct a photon into either the third interferometer or the fourth interferometer.

Claim 20 (Original): The system of claim 19, the detector being further configured to ignore signals from photon pulses which pass through the long arms of either the first and second interferometers and the long arms of either of the third and fourth interferometers and to ignore signals from photon pulses which have passed through the short arms of either of the first and second interferometers and the short arms of either of the third and fourth interferometers.

Claim 21 (Currently Amended): The system of claim 12, wherein the phase encoding means comprises a first station comprising first interferometer having a long arm and a short arm, one of said arms ~~having a~~ comprising phase variation means ~~which allows~~ configured to set the phase of a photon passing through that arm to ~~be set to~~ one of at least two values, a second station comprising means to apply a phase variation ~~which allows~~ configured to set a photon pulse passing therethrough to have its phase ~~set to~~ one of at least two values, and reflecting means to reflect the pulse back through the first interferometer.

Claim 22 (Original): The system of claim 21, wherein the detector is configured to ignore photon pulses which have passed through either the long arm of the first interferometer twice or the short arm of the first interferometer twice.

Claim 23 (Original): The system of claim 22, further comprising directing means configured to ensure that photons which have passed through the short arm of the first interferometer are reflected back through the long arm of the first interferometer and photons which have passed through the long arm of the first interferometer are reflected back through the short arm of the first interferometer.

Claim 24 (Currently Amended): The system of claim 23, wherein the directing means comprises first polarising means configured to ~~allow~~ such that photons which have travelled through different arms of the first interferometer ~~[[to]]~~ have different polarisations, and second polarising means which distinguish between the photons having different polarisations and direct them down the appropriate arm of the first interferometer.

Claim 25 (Currently Amended): The system of claim ~~[[13]]~~ 14, further comprising means to vary the path length of one of the arms of at least one of the interferometers such that photon pulses which take the short arm of one of the first interferometer and the long arm of the second interferometer take the same time to pass through both interferometers as photon pulses which pass through the long arm of the first interferometer and the short arm of the second interferometer.

Claim 26 (Currently Amended): The system of claim ~~[[18]]~~ 19, further comprising means to vary the path length of one of the arms of at least one of the interferometers such that photon pulses which take the short arm of first or second interferometers and the long

arm of the third or fourth interferometers take the same time to pass through both interferometers as photon pulses which pass through the long arm of the first or second interferometers and the short arm of the third or fourth interferometers.

Claim 27 (Original): The system of claim 10, wherein the photons are encoded using polarisation.

Claim 28 (Original): The system of claim 1, wherein there are from 2 to 1000 photon pulses in each group period.

Claim 29 (Original): The system of claim 1, wherein there is a separation from 100 ns to 10 μ s between the final pulse in any group and the first pulse in the following group.

Claim 30 (Original): The system of claim 1, wherein separation between photon pulses is from 0.5 to 5 ns.

Claim 31 (Original): The system of claim 1, wherein the probability of a photon being present in a photon pulse is less than 0.2.

Claim 32 (Original): The system of claim 1, wherein said emitter comprises a photon source, means to subdivide the output of said source into a plurality of optical fibres having differing lengths and combiner means to combine said plurality of fibres such that a plurality of pulses spaced apart in time are outputted from said combiner means.

Claim 33 (Currently Amended): A method of quantum communication comprising:
emitting a plurality of photon pulses in groups of photon pulses from an emitter, each group of photon pulses emitted over a group time period, ~~each photon pulse having a probability of containing at most one photon, wherein the average number of photons per pulse is less than 1;~~

detecting the emitted photon pulses, wherein the separation between pulses in said group of pulses is less than the time when a detector may register an after pulse signal or a false positive reading, and the detector is in an on state for at least the duration of two photon pulses during said group time period during detection; and

ignoring a second or subsequent pulse in a group of pulses received by the detector in a group time period after a first pulse has been detected for the group of pulses.

Claim 34 (Currently Amended): A method of operating a detector in quantum communication system, wherein a plurality of photon pulses are sent to the detector in groups of photon pulses from an emitter, each group of photon pulses emitted over a group time period, ~~each photon pulse having a probability of containing at most one photon, wherein the average number of photons per pulse is less than 1,~~ the method comprising:

detecting the emitted photon pulses, wherein the separation between pulses in said group of pulses is less than the time when a detector may register an after pulse signal or a false positive reading, and the detector is in an on state for at least the duration of two photon pulses during said group time period during detection; and

ignoring a second or subsequent pulses in a group of pulses received by the detector in a group time period after a first pulse has been detected for the group of pulses.